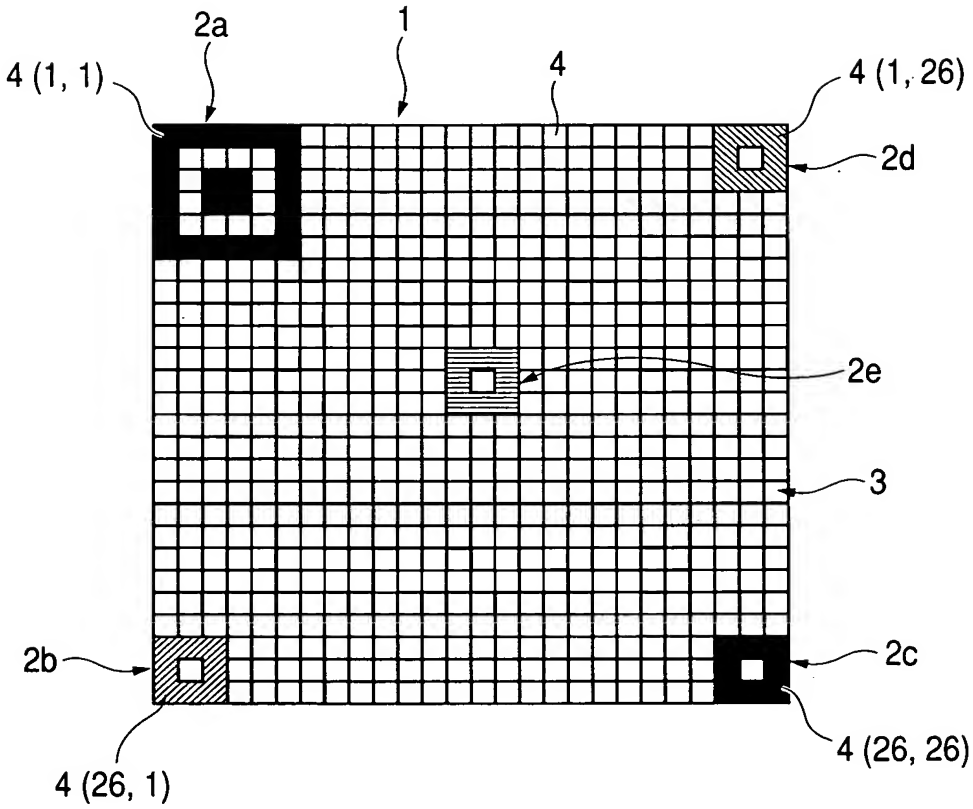
OIPE JC139
JUN 2 4 2004
PATENT & TRADEMARK OFFICE

FIG. 1A



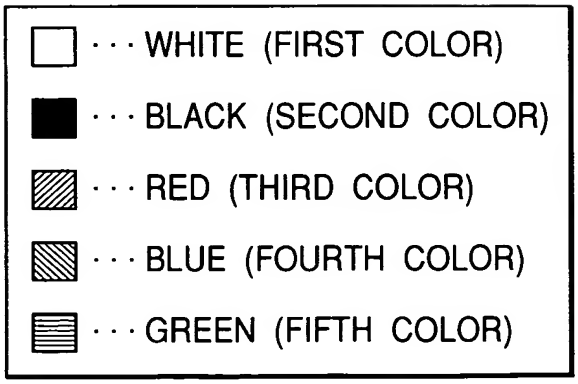


FIG. 1B

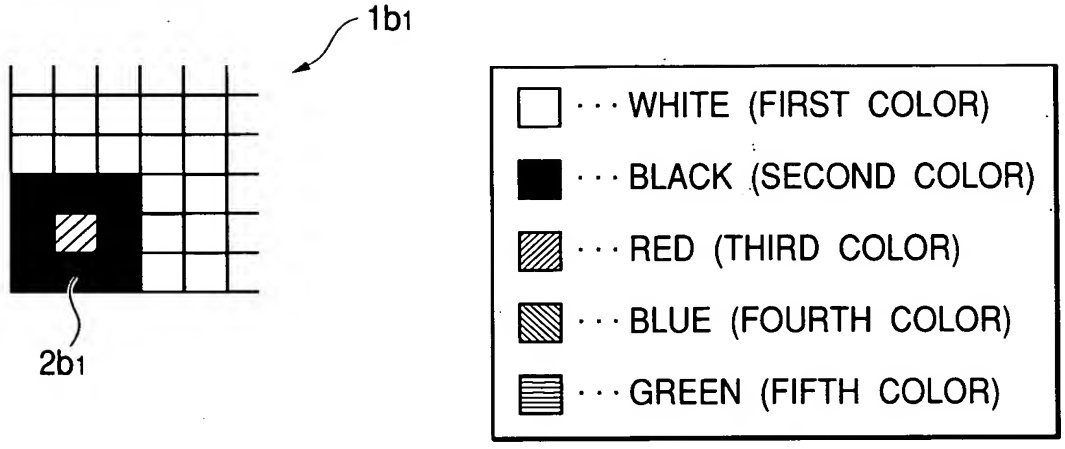

1b1
2b1
··· WHITE (FIRST COLOR)
··· BLACK (SECOND COLOR)
··· RED (THIRD COLOR)
··· BLUE (FOURTH COLOR)
··· GREEN (FIFTH COLOR)

FIG. 1C

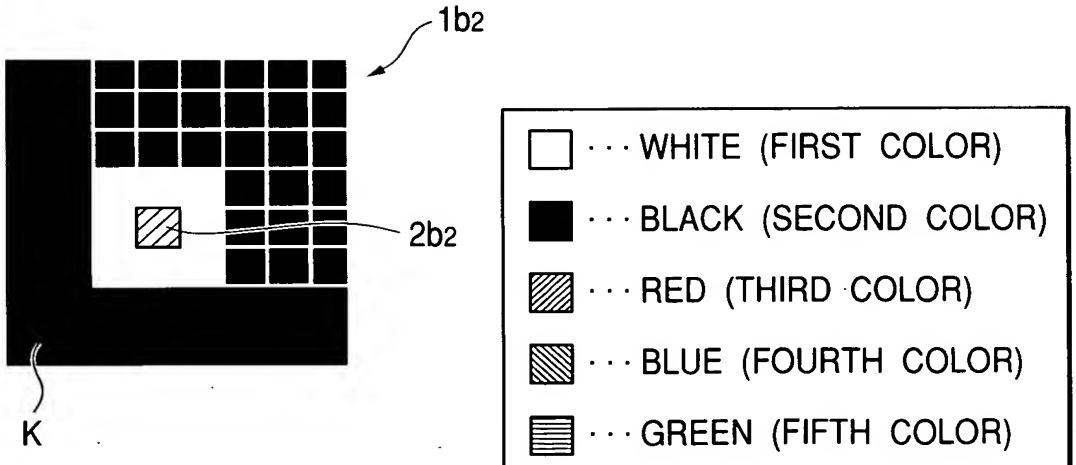
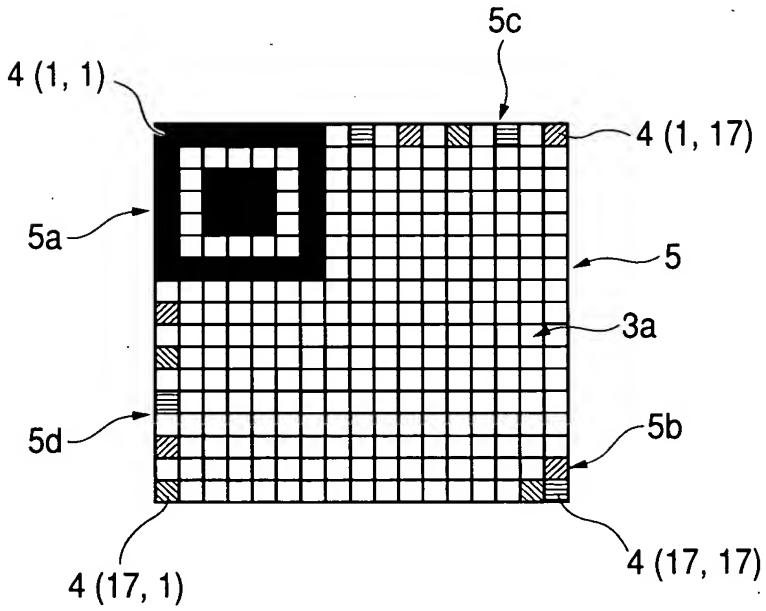

1b2
2b2
K
··· WHITE (FIRST COLOR)
··· BLACK (SECOND COLOR)
··· RED (THIRD COLOR)
··· BLUE (FOURTH COLOR)
··· GREEN (FIFTH COLOR)

FIG. 2A


5c
4 (1, 1)
4 (1, 17)
5a
5
3a
5d
5b
4 (17, 1)
4 (17, 17)

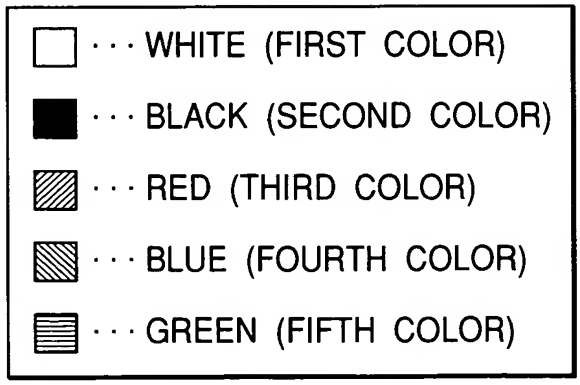
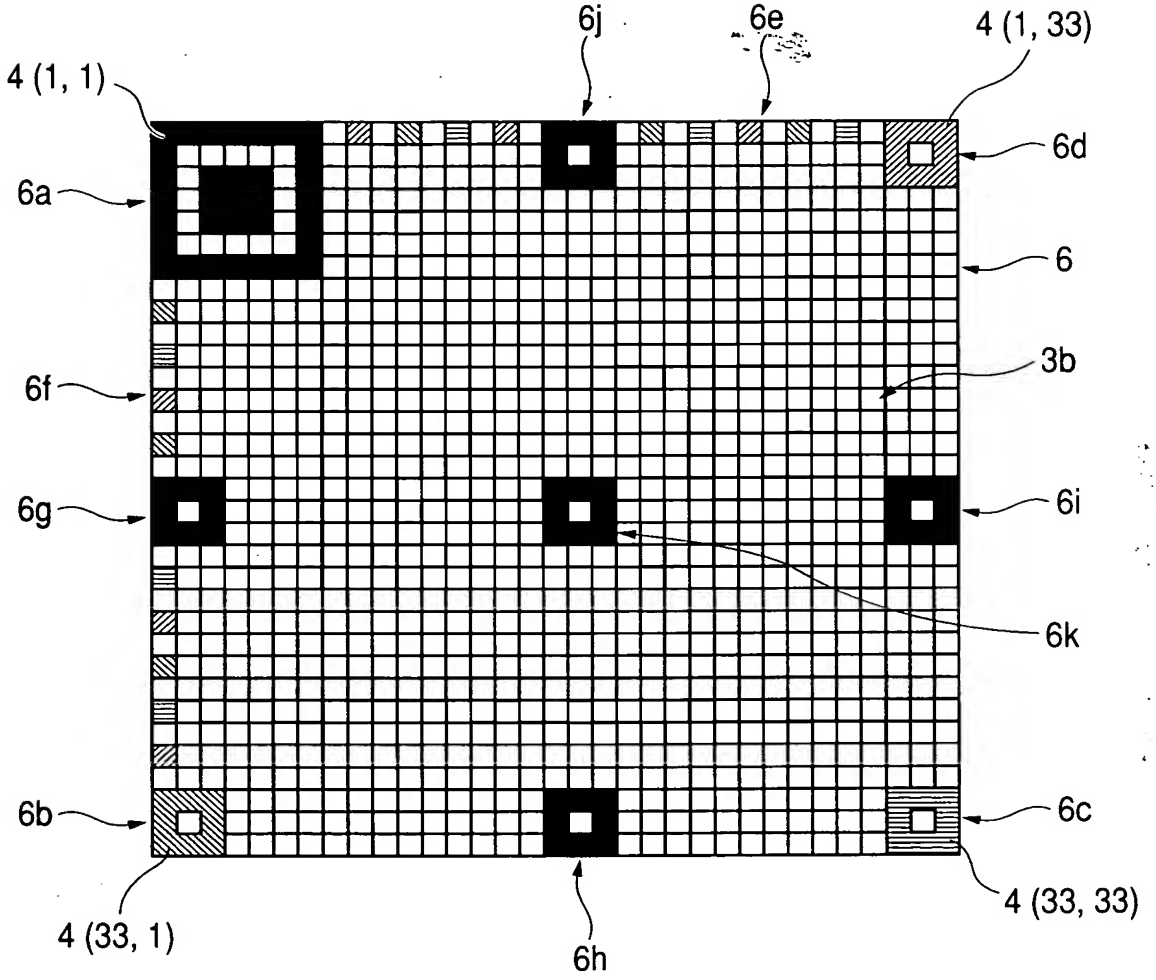

· · · WHITE (FIRST COLOR)
· · · BLACK (SECOND COLOR)
· · · RED (THIRD COLOR)
· · · BLUE (FOURTH COLOR)
· · · GREEN (FIFTH COLOR)

FIG. 2B


6j
6e
4 (1, 33)
4 (1, 1)
6d
6a
6
6f
3b
6g
6i
6k
6b
6c
4 (33, 1)
6h
4 (33, 33)

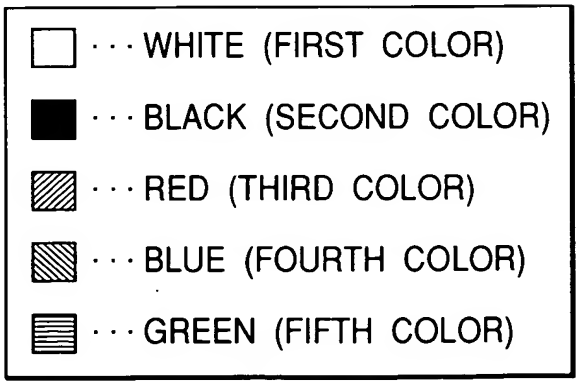

· · · WHITE (FIRST COLOR)
· · · BLACK (SECOND COLOR)
· · · RED (THIRD COLOR)
· · · BLUE (FOURTH COLOR)
· · · GREEN (FIFTH COLOR)

FIG. 2C

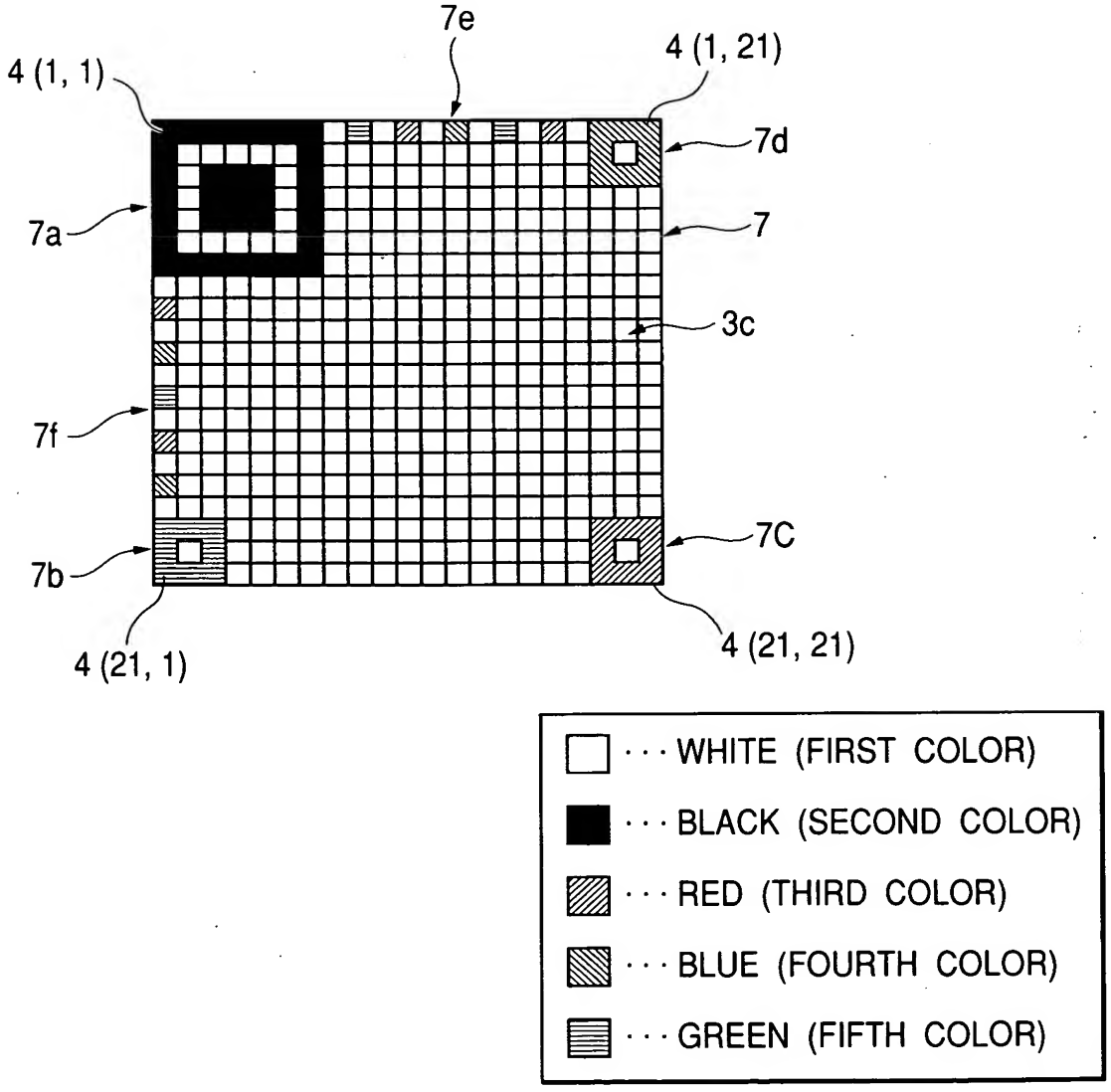

7e
4 (1, 1)
4 (1, 21)
7d
7a
7
3c
7f
7C
7b
4 (21, 1)
4 (21, 21)
··· WHITE (FIRST COLOR)
··· BLACK (SECOND COLOR)
··· RED (THIRD COLOR)
··· BLUE (FOURTH COLOR)
··· GREEN (FIFTH COLOR)

FIG. 3

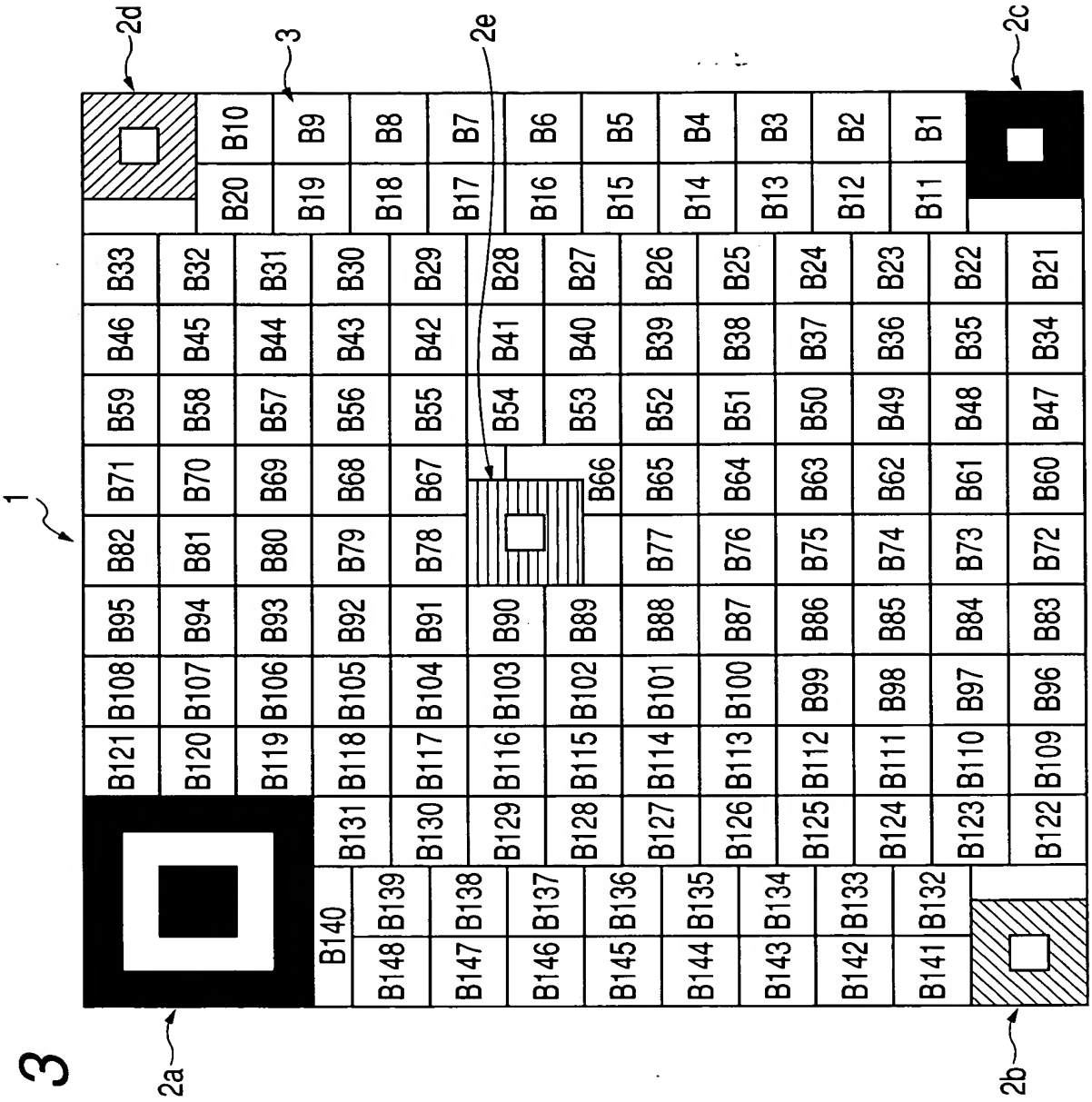
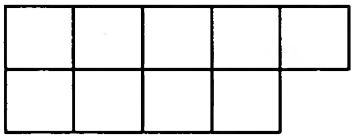

1
2a
2b
2c
2d
2e
3
B1 B2 B3 B4 B5 B6 B7 B8 B9 B10
B11 B12 B13 B14 B15 B16 B17 B18 B19 B20
B21 B22 B23 B24 B25 B26 B27 B28 B29 B30 B31 B32 B33
B34 B35 B36 B37 B38 B39 B40 B41 B42 B43 B44 B45 B46
B47 B48 B49 B50 B51 B52 B53 B54 B55 B56 B57 B58 B59
B60 B61 B62 B63 B64 B65 B66 B67 B68 B69 B70 B71
B72 B73 B74 B75 B76 B77 B78 B79 B80 B81 B82
B83 B84 B85 B86 B87 B88 B89 B90 B91 B92 B93 B94 B95
B96 B97 B98 B99 B100 B101 B102 B103 B104 B105 B106 B107 B108
B109 B110 B111 B112 B113 B114 B115 B116 B117 B118 B119 B120 B121
B122 B123 B124 B125 B126 B127 B128 B129 B130 B131
B132 B133 B134 B135 B136 B137 B138 B139 B140
B141 B142 B143 B144 B145 B146 B147 B148

FIG. 4A

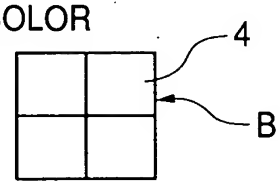
DATA VALUE "0"
DATA (0, 0, 0, 0, 0, 0, 0, 0, 0)



- ··· WHITE (FIRST COLOR) → DATA 0
- ··· BLACK (SECOND COLOR) → DATA 4
- ··· RED (THIRD COLOR) → DATA 1
- ··· BLUE (FOURTH COLOR) → DATA 3
- ··· GREEN (FIFTH COLOR) → DATA 2

FIG. 4B

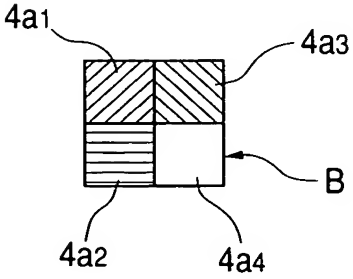
DATA (0, 0, 0, 0)
COLOR



- ··· WHITE (FIRST COLOR) → DATA 0
- ··· BLACK (SECOND COLOR) → DATA 4
- ··· RED (THIRD COLOR) → DATA 1
- ··· BLUE (FOURTH COLOR) → DATA 3
- ··· GREEN (FIFTH COLOR) → DATA 2

FIG. 4C

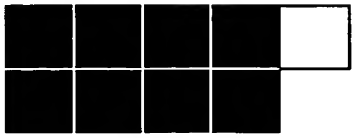
DATA (1, 2, 3, 0)



- ··· WHITE (FIRST COLOR) → DATA 0
- ··· BLACK (SECOND COLOR) → DATA 4
- ··· RED (THIRD COLOR) → DATA 1
- ··· BLUE (FOURTH COLOR) → DATA 3
- ··· GREEN (FIFTH COLOR) → DATA 2

FIG. 4D

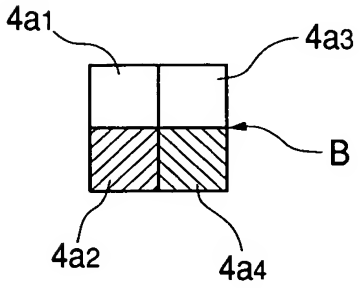
DATA (1, 1, 1, 1, 1, 1, 1, 1, 0)



- ··· WHITE (FIRST COLOR) → DATA 0
- ··· BLACK (SECOND COLOR) → DATA 4
- ··· RED (THIRD COLOR) → DATA 1
- ··· BLUE (FOURTH COLOR) → DATA 3
- ··· GREEN (FIFTH COLOR) → DATA 2

FIG. 4E

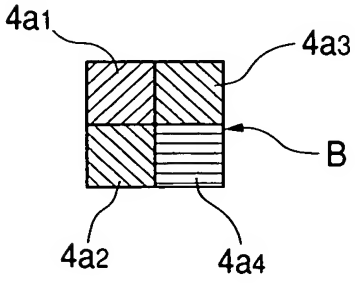
DATA (0, 1, 0, 2)



- ··· WHITE (FIRST COLOR) → DATA 0
- ··· BLACK (SECOND COLOR) → DATA 4
- ··· RED (THIRD COLOR) → DATA 1
- ··· BLUE (FOURTH COLOR) → DATA 3
- ··· GREEN (FIFTH COLOR) → DATA 2

FIG. 4F

DATA (1, 3, 3, 2)



- ··· WHITE (FIRST COLOR) → DATA 0
- ··· BLACK (SECOND COLOR) → DATA 4
- ··· RED (THIRD COLOR) → DATA 1
- ··· BLUE (FOURTH COLOR) → DATA 3
- ··· GREEN (FIFTH COLOR) → DATA 2

FIG. 5

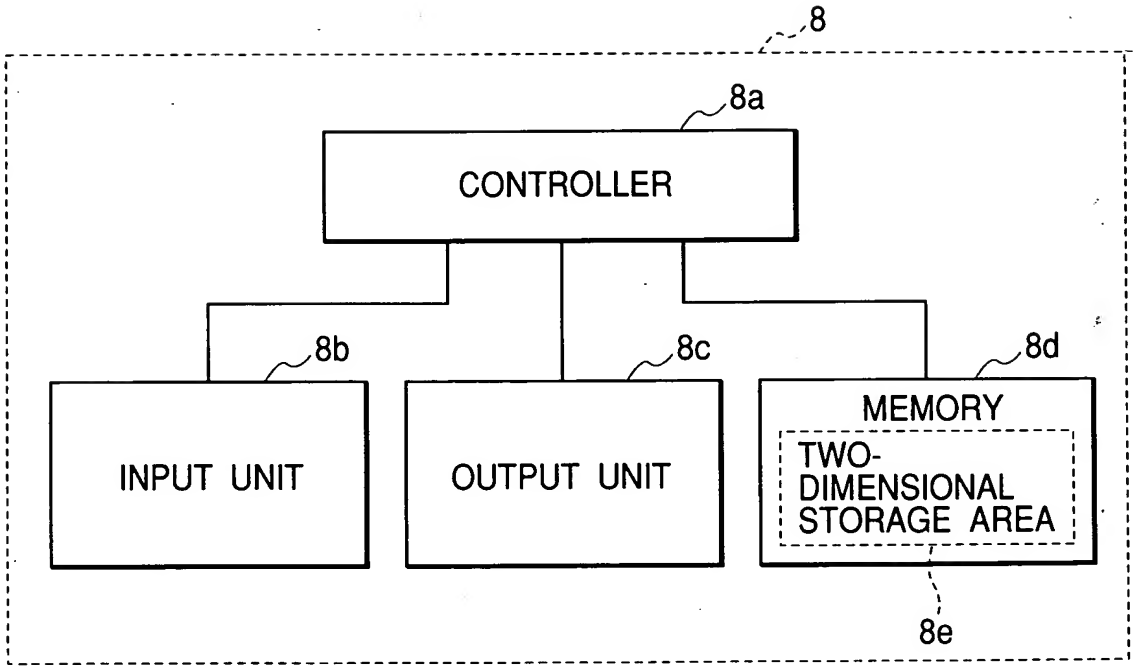

8
8a
CONTROLLER
8b
8c
8d
INPUT UNIT
OUTPUT UNIT
MEMORY
TWO-
DIMENSIONAL
STORAGE AREA
8e

FIG. 6

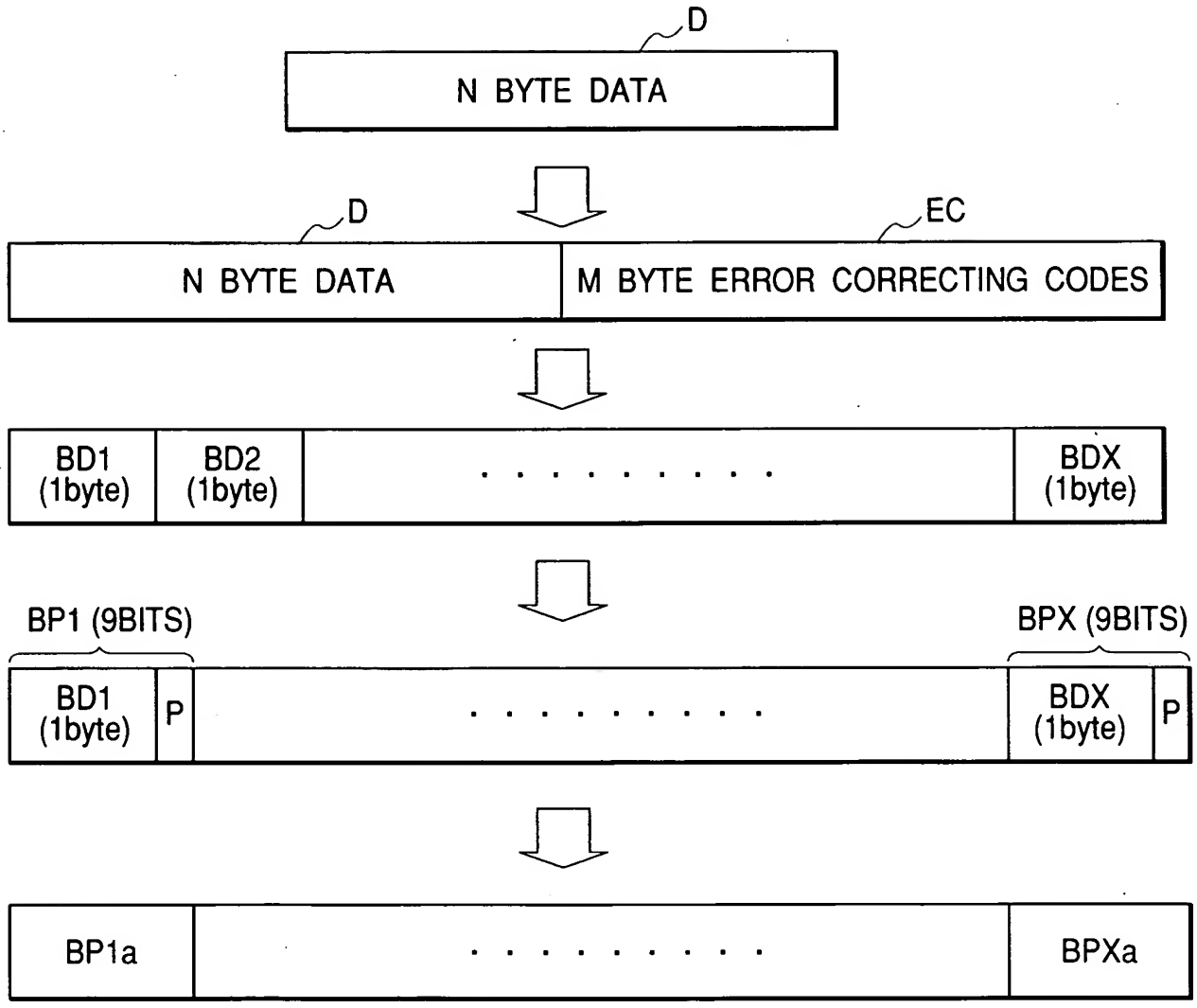

D
N BYTE DATA
D
EC
N BYTE DATA
M BYTE ERROR CORRECTING CODES
BD1 (1byte)
BD2 (1byte)
BDX (1byte)
BP1 (9BITS)
BPX (9BITS)
BD1 (1byte)
P
BDX (1byte)
P
BP1a
BPXa

FIG. 7

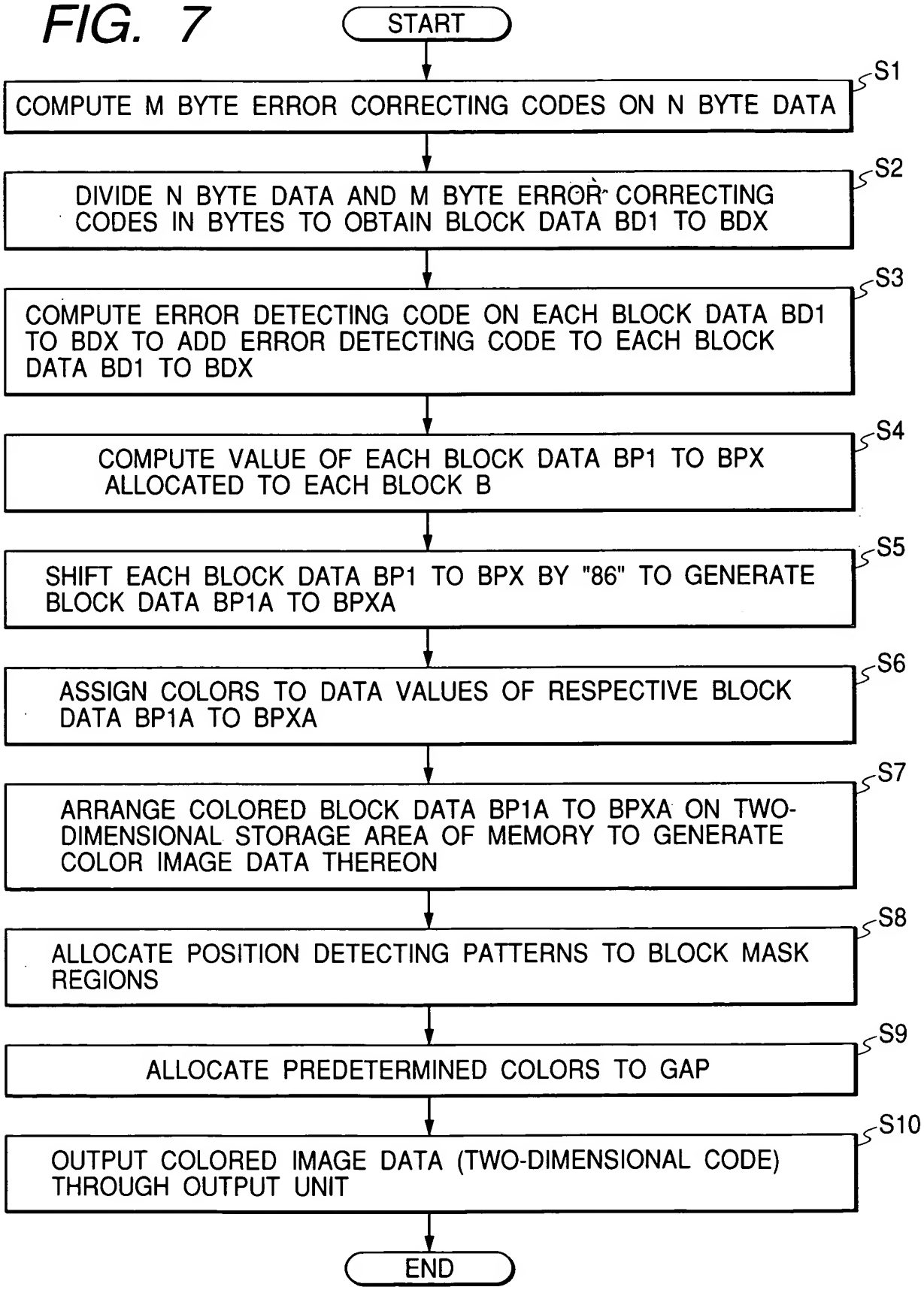

START
S1
COMPUTE M BYTE ERROR CORRECTING CODES ON N BYTE DATA
S2
DIVIDE N BYTE DATA AND M BYTE ERROR CORRECTING CODES IN BYTES TO OBTAIN BLOCK DATA BD1 TO BDX
S3
COMPUTE ERROR DETECTING CODE ON EACH BLOCK DATA BD1 TO BDX TO ADD ERROR DETECTING CODE TO EACH BLOCK DATA BD1 TO BDX
S4
COMPUTE VALUE OF EACH BLOCK DATA BP1 TO BPX ALLOCATED TO EACH BLOCK B
S5
SHIFT EACH BLOCK DATA BP1 TO BPX BY "86" TO GENERATE BLOCK DATA BP1A TO BPXA
S6
ASSIGN COLORS TO DATA VALUES OF RESPECTIVE BLOCK DATA BP1A TO BPXA
S7
ARRANGE COLORED BLOCK DATA BP1A TO BPXA ON TWO-DIMENSIONAL STORAGE AREA OF MEMORY TO GENERATE COLOR IMAGE DATA THEREON
S8
ALLOCATE POSITION DETECTING PATTERNS TO BLOCK MASK REGIONS
S9
ALLOCATE PREDETERMINED COLORS TO GAP
S10
OUTPUT COLORED IMAGE DATA (TWO-DIMENSIONAL CODE) THROUGH OUTPUT UNIT
END

FIG. 8

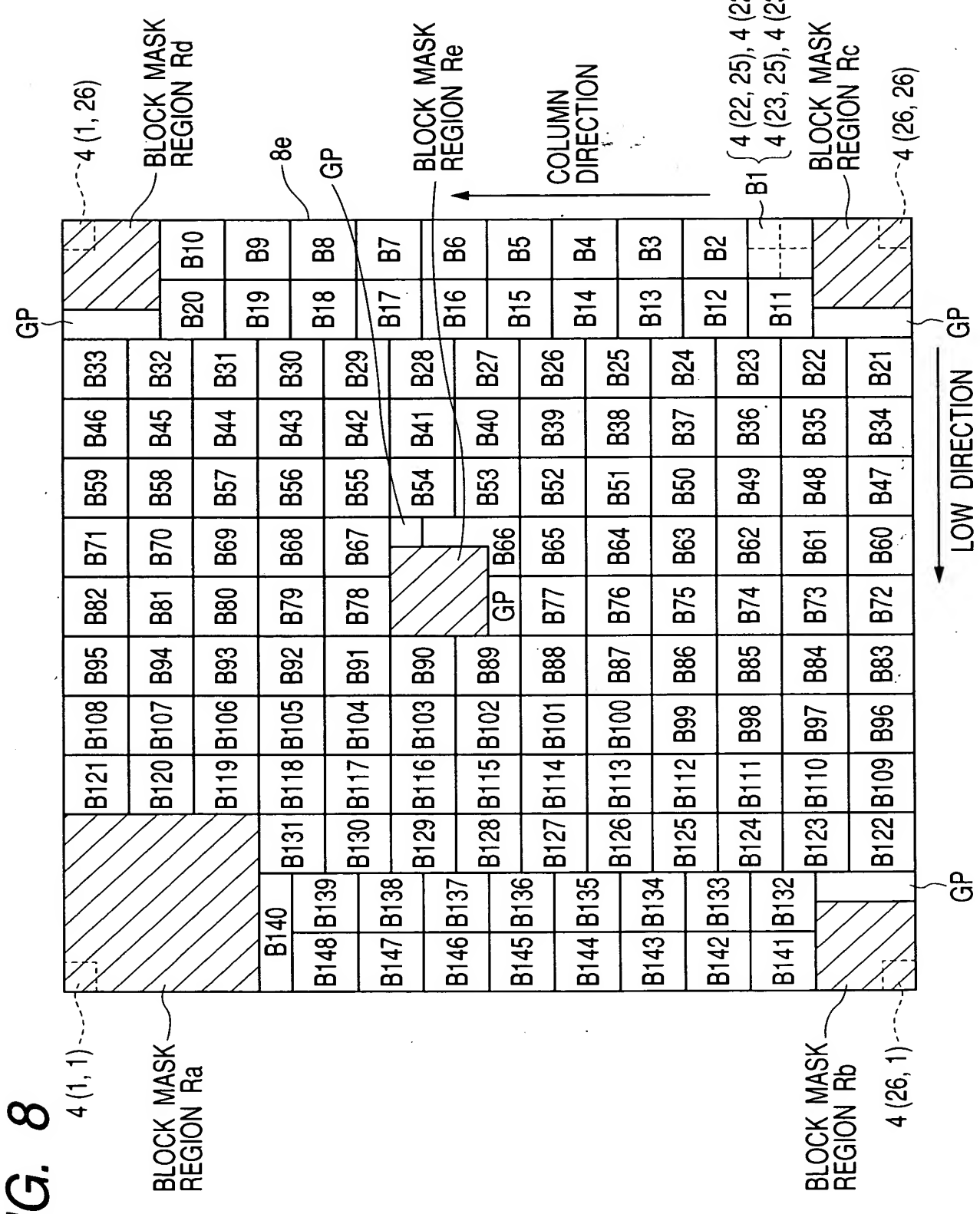

4 (1, 1)
BLOCK MASK REGION Ra
4 (1, 26)
BLOCK MASK REGION Rd
BLOCK MASK REGION Re
BLOCK MASK REGION Rb
BLOCK MASK REGION Rc
4 (26, 1)
4 (26, 26)
8e
GP
COLUMN DIRECTION
LOW DIRECTION
B1
4 (22, 25), 4 (22, 26)
4 (23, 25), 4 (23, 26)

FIG. 9

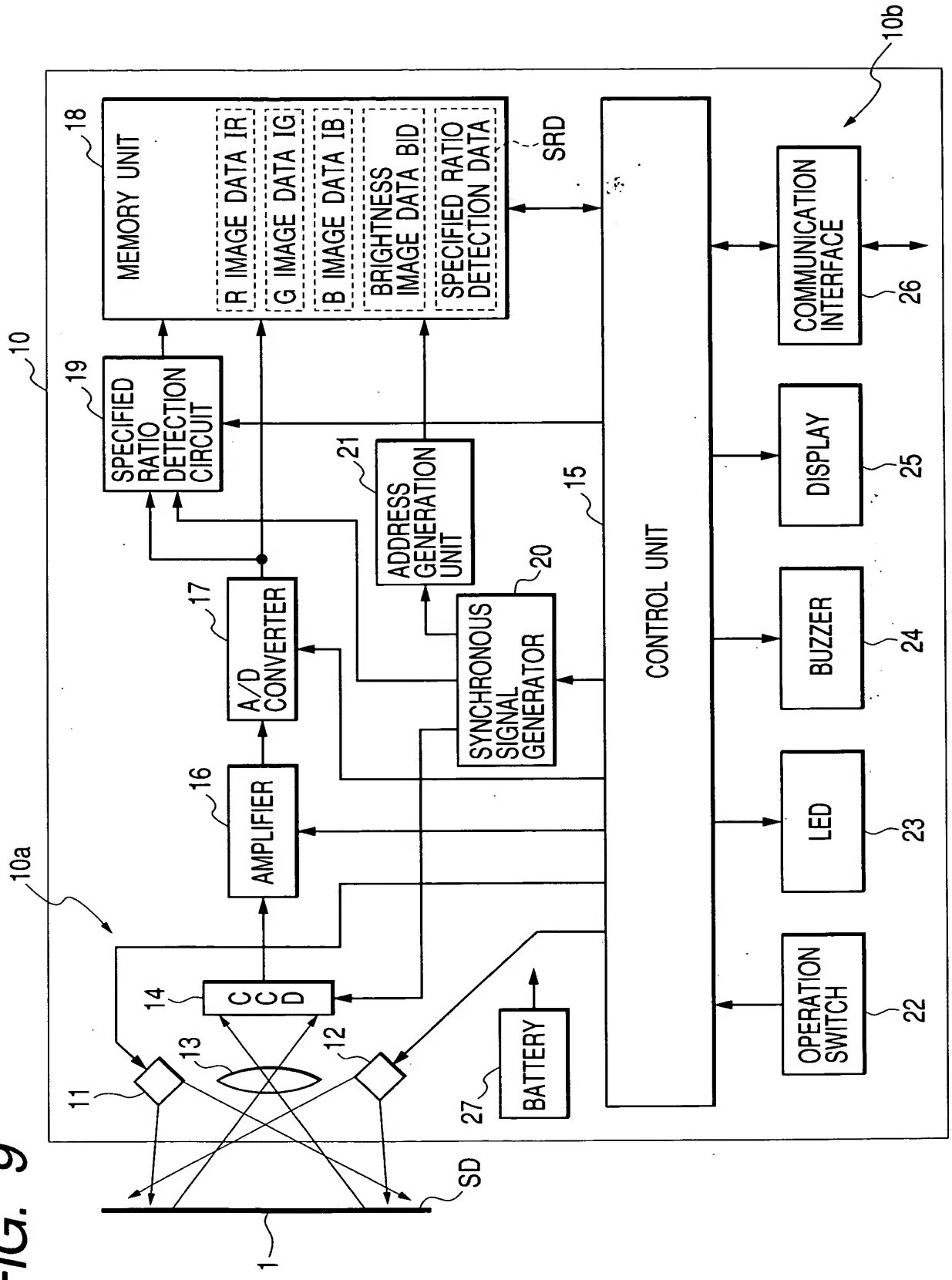

10b
10
10a
18
MEMORY UNIT
R IMAGE DATA IR
G IMAGE DATA IG
B IMAGE DATA IB
BRIGHTNESS IMAGE DATA BID
SPECIFIED RATIO DETECTION DATA
SRD
19
SPECIFIED RATIO DETECTION CIRCUIT
21
ADDRESS GENERATION UNIT
15
CONTROL UNIT
COMMUNICATION INTERFACE
26
DISPLAY
25
17
A/D CONVERTER
20
SYNCHRONOUS SIGNAL GENERATOR
BUZZER
24
16
AMPLIFIER
LED
23
14
CCD
OPERATION SWITCH
22
13
12
11
27
BATTERY
SD
1

FIG. 10

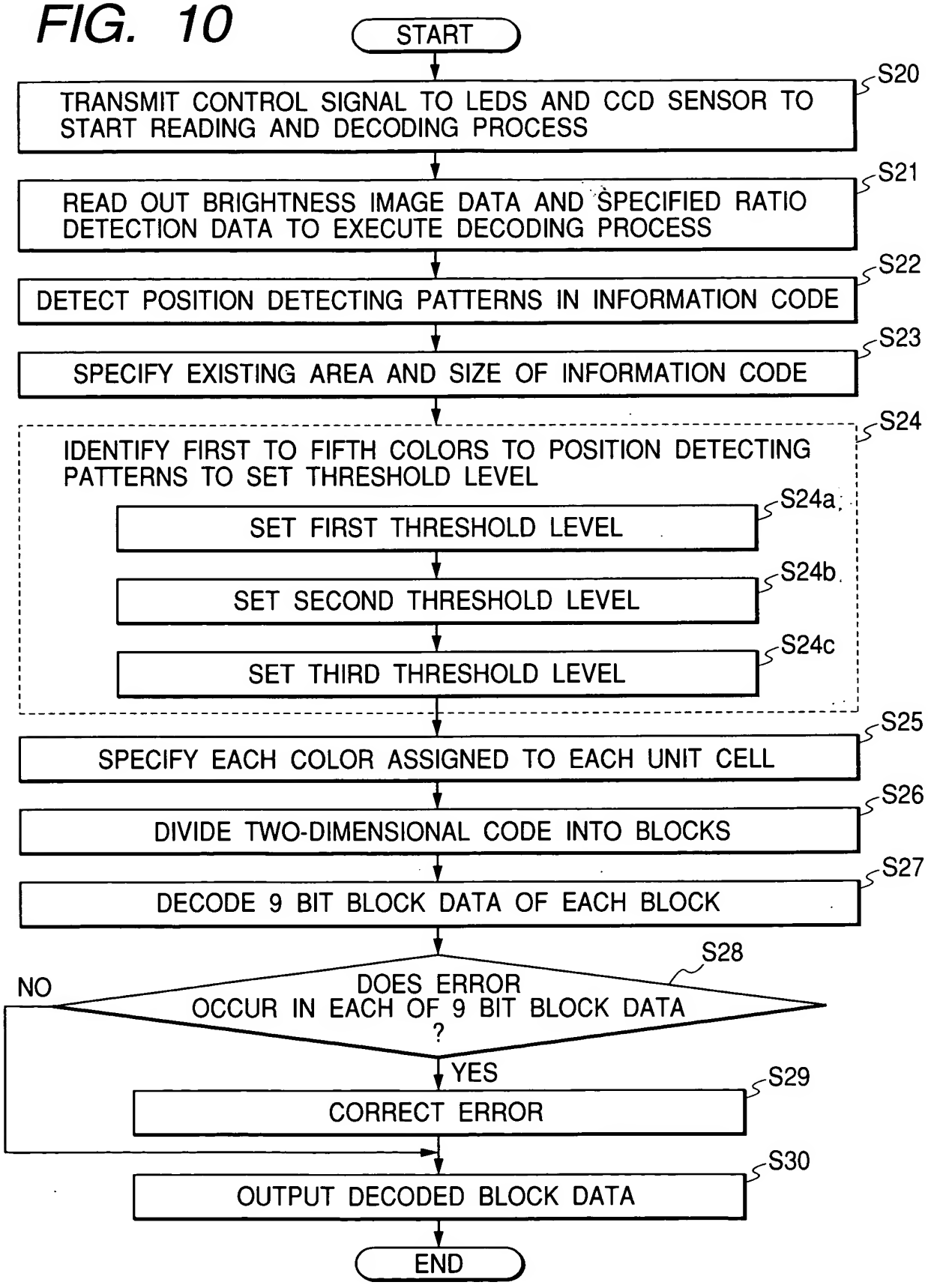

START
TRANSMIT CONTROL SIGNAL TO LEDS AND CCD SENSOR TO START READING AND DECODING PROCESS
S20
READ OUT BRIGHTNESS IMAGE DATA AND SPECIFIED RATIO DETECTION DATA TO EXECUTE DECODING PROCESS
S21
DETECT POSITION DETECTING PATTERNS IN INFORMATION CODE
S22
SPECIFY EXISTING AREA AND SIZE OF INFORMATION CODE
S23
IDENTIFY FIRST TO FIFTH COLORS TO POSITION DETECTING PATTERNS TO SET THRESHOLD LEVEL
S24
SET FIRST THRESHOLD LEVEL
S24a
SET SECOND THRESHOLD LEVEL
S24b
SET THIRD THRESHOLD LEVEL
S24c
SPECIFY EACH COLOR ASSIGNED TO EACH UNIT CELL
S25
DIVIDE TWO-DIMENSIONAL CODE INTO BLOCKS
S26
DECODE 9 BIT BLOCK DATA OF EACH BLOCK
S27
DOES ERROR OCCUR IN EACH OF 9 BIT BLOCK DATA ?
S28
NO
YES
CORRECT ERROR
S29
OUTPUT DECODED BLOCK DATA
S30
END

FIG. 11

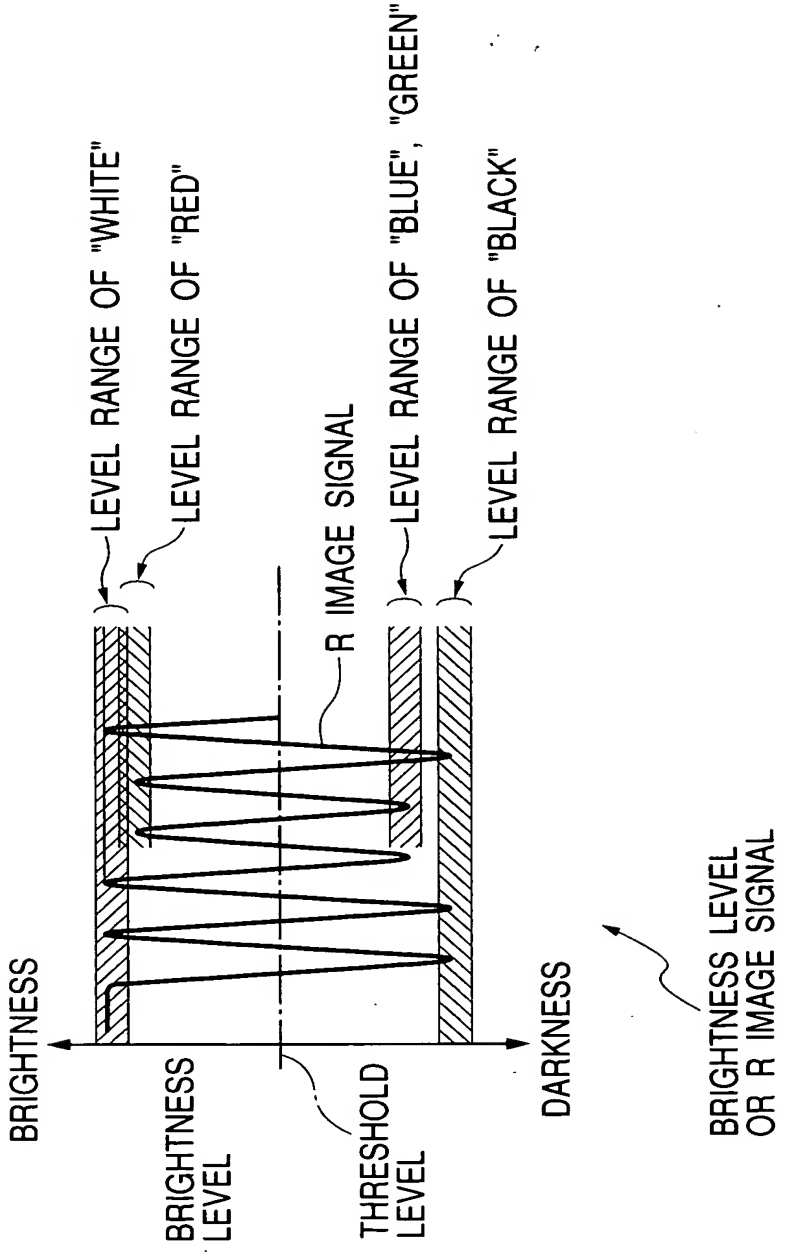

LEVEL RANGE OF "WHITE"
LEVEL RANGE OF "RED"
R IMAGE SIGNAL
LEVEL RANGE OF "BLUE", "GREEN"
LEVEL RANGE OF "BLACK"
BRIGHTNESS
DARKNESS
BRIGHTNESS LEVEL
THRESHOLD LEVEL
BRIGHTNESS LEVEL OR R IMAGE SIGNAL

FIG. 12

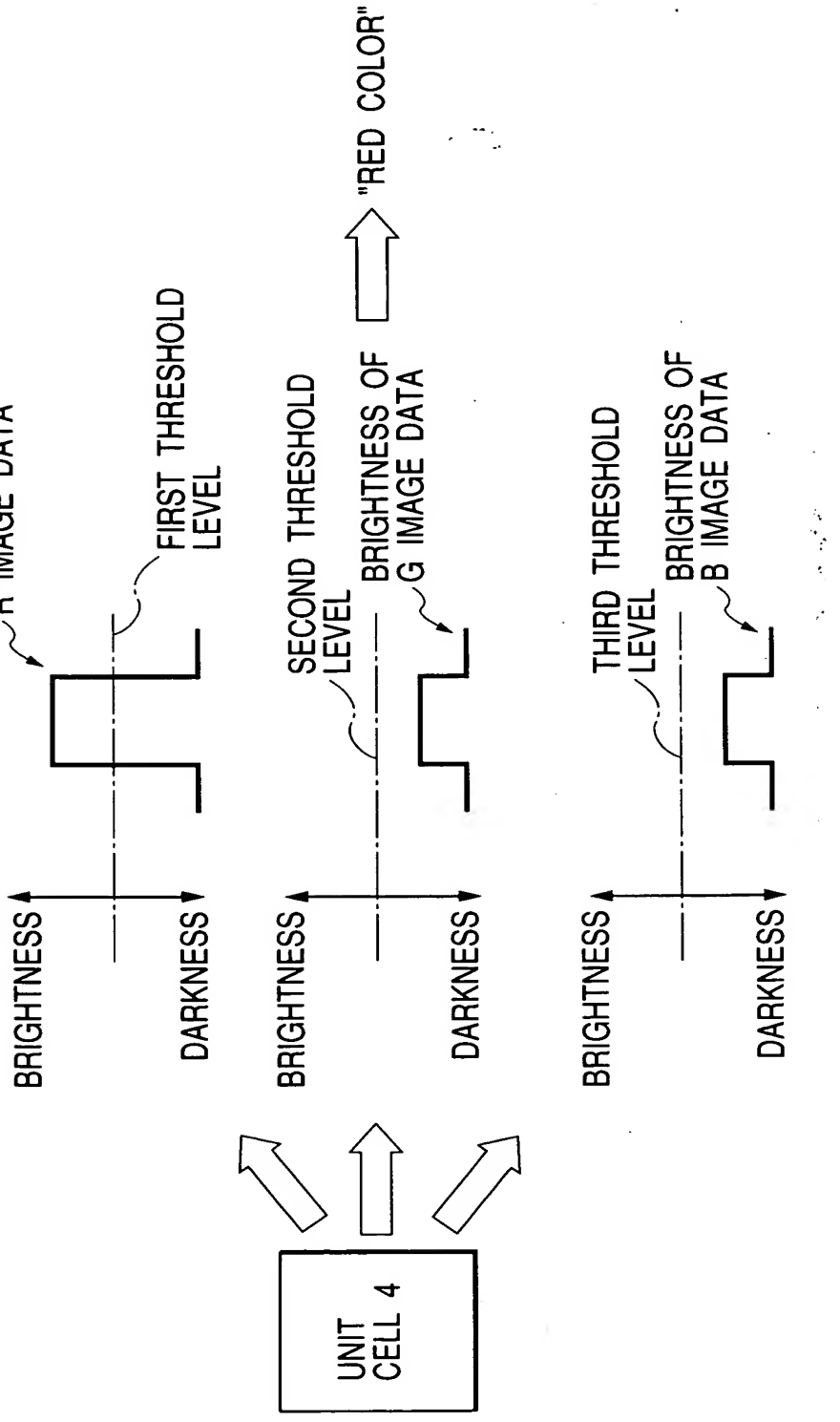

UNIT CELL 4
BRIGHTNESS OF R IMAGE DATA
FIRST THRESHOLD LEVEL
BRIGHTNESS
DARKNESS
SECOND THRESHOLD LEVEL
BRIGHTNESS OF G IMAGE DATA
BRIGHTNESS
DARKNESS
THIRD THRESHOLD LEVEL
BRIGHTNESS OF B IMAGE DATA
BRIGHTNESS
DARKNESS
"RED COLOR"

FIG. 13

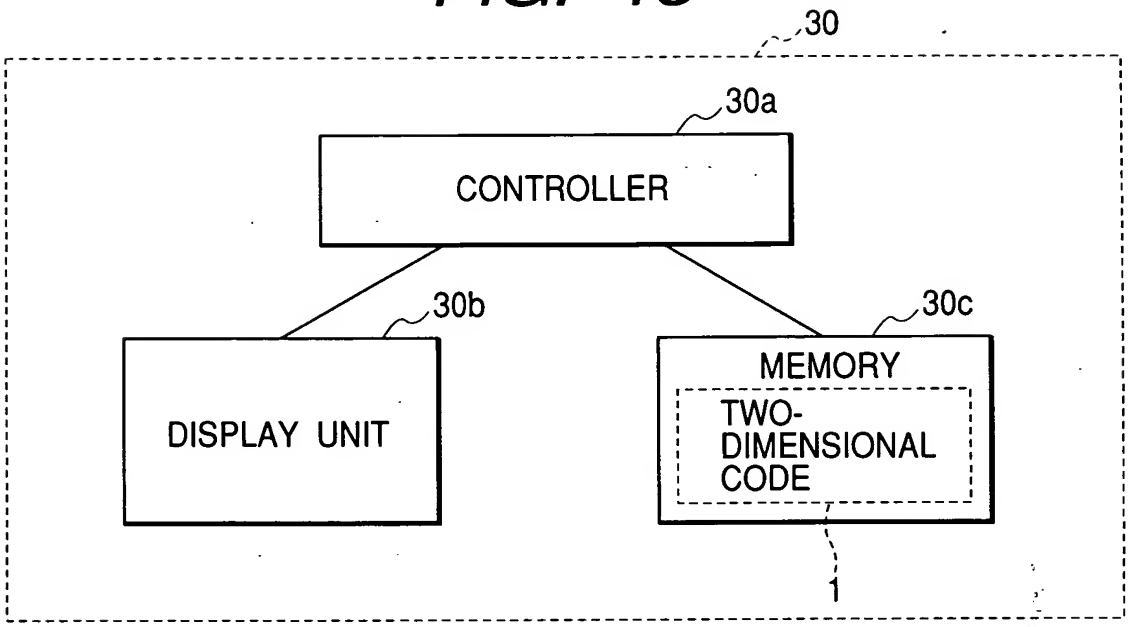
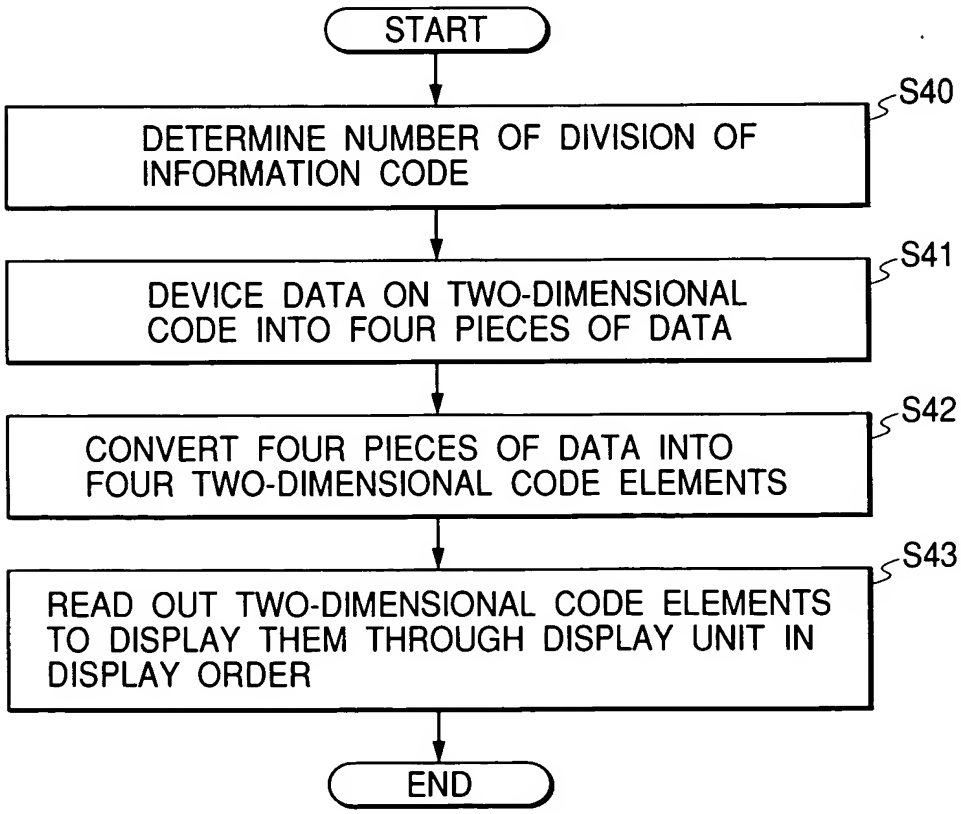

30
30a
CONTROLLER
30b
DISPLAY UNIT
30c
MEMORY
TWO-DIMENSIONAL CODE
1

FIG. 14


START
DETERMINE NUMBER OF DIVISION OF INFORMATION CODE
S40
DEVICE DATA ON TWO-DIMENSIONAL CODE INTO FOUR PIECES OF DATA
S41
CONVERT FOUR PIECES OF DATA INTO FOUR TWO-DIMENSIONAL CODE ELEMENTS
S42
READ OUT TWO-DIMENSIONAL CODE ELEMENTS TO DISPLAY THEM THROUGH DISPLAY UNIT IN DISPLAY ORDER
S43
END

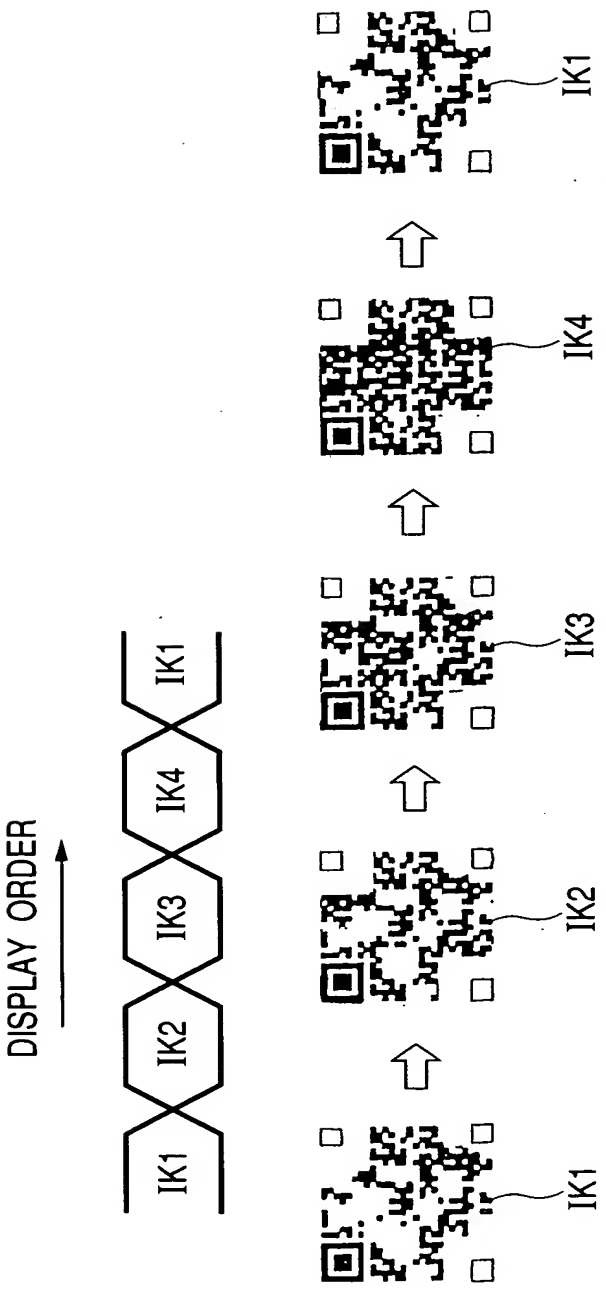



FIG. 15